WHAT IS CLAIMED IS:

1. A method of downconverting a first communication signal at a first frequency into a second communication signal at a second frequency that is lower than the first frequency, comprising:

sampling a plurality of phases of each of at least two consecutive cycles of the first communication signal; and

combining the sampled phases to produce the second communication signal.

2. The method of Claim 1, wherein said sampling step includes sampling a plurality of phases of all cycles of the first communication signal.

3. The method of Claim 1, wherein said sampling step includes producing a sampling pulse signal having a plurality of digital pulses, each of said pulses having a pulse width that is approximately equal to but wider than a half period of the first communication signal, and using the pulses of the sampling pulse signal to sample the first communication signal.

4. The method of Claim 3, wherein said sampling step includes using one of the pulses of the sampling pulse signal to sample one of the phases of said consecutive cycles, and using a plurality of delayed versions of said one pulse to sample other phases of said consecutive cycles.

5. The method of Claim 4, including applying said one pulse and the delayed versions thereof respectively to a plurality of sampling switches.

6. The method of Claim 4, including using a series of delay elements driven by the sampling pulse signal to produce the delayed versions of said one pulse.

7. The method of Claim 4, wherein adjacent pulses of the sampling pulse signal are separated by an amount of time that corresponds to a predetermined number of cycles of the first communication signal.

8. The method of Claim 1, including providing an oscillator signal having a third frequency that is lower than said first frequency, and using the oscillator signal to produce a digital signal for use in sampling the first communication signal.

9. The method of Claim 8, wherein the digital signal has a plurality of digital pulses, each of said pulses having a pulse width that is approximately equal to but wider than a half period of the first communication signal.

10. The method of Claim 1, wherein the first communication signal is an RF communication signal.

11. The method of Claim 1, wherein said sampling step includes applying a plurality of digital pulses respectively to a plurality of sampling gates to sample respectively the phases of said consecutive cycles.

12. A method of downconverting a first communication signal at a first frequency into a second communication signal at a second frequency that is lower than the first frequency, comprising:

providing an oscillator signal having a third frequency that is lower than the first frequency;

producing in response to the oscillator signal a sampling pulse signal having digital pulses for use in sampling the first communication signal;

using the pulses of the sampling pulse signal to sample selected phases of the first communication signal; and

using the sampled phases to produce the second communication signal.

13. The method of Claim 12, wherein the first communication signal is an RF communication signal.

14. The method of Claim 12, wherein adjacent pulses of the sampling pulse signal are separated by an amount of time that corresponds to a predetermined number of cycles of the first communication signal.

15. A method of downconverting a first communication signal at a first frequency into a second communication signal at a second frequency that is lower than the first frequency, comprising:

providing a sampling pulse signal having a plurality of digital pulses, each of said pulses having a pulse width that is approximately equal to but wider than a half period of the first communication signal;

using the pulses of the sampling pulse signal to sample selected phases of the first communication signal; and

using the sampled phases to produce the second communication signal.

16. The method of Claim 15, wherein the first communication signal is an RF communication signal.

17. The method of Claim 15, wherein adjacent pulses of the sampling pulse signal are separated by an amount of time that corresponds to a predetermined number of cycles of the first communication signal.

18. The method of Claim 17, wherein said providing step includes providing an oscillator signal having a third frequency that is lower than the first frequency, and producing the sampling pulse signal in response to the oscillator signal.

19. An apparatus for downconverting a first communication signal at a first frequency into a second communication signal at a second frequency that is lower than the first frequency, comprising:

an input for receiving the first communication signal;

a sampler coupled to said input for sampling a plurality of phases of each of at least two consecutive cycles of the first communication signal; and

a combiner coupled to said sampler for combining the sampled phases to produce the second communication signal.

20. The apparatus of Claim 19, wherein said sampler includes a plurality of sampling switches coupled to said input for sampling the first communication signal.

21. The apparatus of Claim 19, wherein said sampler is operable for sampling a plurality of phases of all cycles of the first communication signal.

22. The apparatus of Claim 19, including a digital pulse generator coupled to said sampler for producing a sampling pulse signal having a plurality of digital pulses, each of said pulses having a pulse width that is approximately equal to but wider than a

half period of the first communication signal, said sampler responsive to said sampling pulse signal for sampling the first communication signal.

23. The apparatus of Claim 22, wherein said sampler has an input for receiving one of said digital pulses and a plurality of delayed versions of said one digital pulse, said sampler responsive to said one digital pulse for sampling one of the phases of said consecutive cycles, and said sampler responsive to said delayed versions of said one pulse for sampling other phases of said consecutive cycles.

24. The apparatus of Claim 23, including a delay element structure coupled to said digital pulse generator and said sampler for producing the delayed versions of said one pulse and providing the delayed versions to said sampler input.

25. The apparatus of Claim 23, wherein adjacent pulses of the sampling pulse signal are separated by an amount of time that corresponds to a predetermined number of cycles of the first communication signal.

26. The apparatus of Claim 23, wherein said sampler includes a plurality of sampling switches coupled to said first-mentioned input and to said sampler input for respectively sampling phases of said consecutive cycles of the first communication signal in response to said one pulse and said delayed versions of said one pulse.

27. The apparatus of Claim 22, including an oscillator coupled to said digital pulse generator for producing an oscillator signal having a third frequency that is lower than said first frequency, said digital pulse generator responsive to said oscillator signal for producing said sampling pulse signal.

28. The apparatus of Claim 27, wherein adjacent pulses of the sampling pulse signal are separated by an amount of time that corresponds to a predetermined number of cycles of the first communication signal.

29. The apparatus of Claim 19, wherein the first communication signal is an RF communication signal.

30. The apparatus of Claim 19, wherein said combiner includes filters respectively for receiving selected ones of the sampled phases.

31. An apparatus for downconverting a first communication signal at a first frequency into a second communication signal at a second frequency that is lower than the first frequency, comprising:

an input for receiving the first communication signal;

an oscillator for producing an oscillator signal having a third frequency that is lower than the first frequency;

a digital pulse generator coupled to said oscillator and responsive to said oscillator signal for producing a sampling pulse signal having digital pulses for use in sampling the first communication signal;

a sampler coupled to said input and said digital pulse generator, said sampler responsive to the pulses of the sampling pulse signal for sampling selected phases of the first communication signal; and

a combiner coupled to said sampler for combining sampled phases of the first communication signal to produce the second communication signal.

32. The apparatus of Claim 31, wherein the first communication signal is an RF communication signal.

33. The apparatus of Claim 31, wherein adjacent pulses of the sampling pulse signal are separated by an amount of time that corresponds to a predetermined number of cycles of the first communication signal.

34. An apparatus for downconverting a first communication signal at a first frequency into a second communication signal at a second frequency that is lower than the first frequency, comprising:

an input for receiving the first communication signal;

a digital pulse generator for providing a sampling pulse signal having a plurality of digital pulses, each of said pulses having a pulse width that is approximately equal to but wider than a half period of the first communication signal;

a sampler coupled to said input and said digital pulse generator, said sampler responsive to the pulses of the sampling pulse signal for sampling selected phases of the first communication signal; and

a combiner coupled to said sampler for combining sampled phases of the first communication signal to produce the second communication signal.

35. The apparatus of Claim 34, wherein the first communication signal is an RF communication signal.

36. The apparatus of Claim 34, wherein adjacent pulses of the sampling pulse signal are separated by an amount of time that corresponds to a predetermined number of cycles of the first communication signal.

37. The method of Claim 1, wherein said sampling step includes sampling said phases such that said combining step also provides a filter function.

38. The method of Claim 12, wherein said step of using pulses includes using the pulses of the sampling pulse signal to sample selected phases such that said step of using sampled phases also provides a filter function.

39. The method of Claim 15, wherein said step of using pulses includes using the pulses of the sampling pulse signal to sample selected phases such that said step of using sampled phases also provides a filter function.

40. The apparatus of Claim 19, wherein said sampler is operable for sampling said phases such that said combiner also provides a filter function.

41. The apparatus of Claim 31, wherein said sampler is operable for sampling said phases such that said combiner also provides a filter function.

42. The apparatus of Claim 34, wherein said sampler is operable for sampling said phases such that said combiner also provides a filter function.

43. The method of Claim 14, wherein said predetermined amount of time is greater than an amount of time required for completion of said predetermined number of cycles of the first communication signal, wherein said step of using pulses includes using a first pulse of the sampling pulse signal to sample a first phase of a first cycle of the first communication signal and using a second pulse of the sampling pulse signal to sample a

second phase of a second cycle of the first communication signal, wherein said first and second pulses are adjacent one another in the sampling pulse signal, wherein said second phase is a different phase than said first phase, and wherein said second cycle follows said first cycle by a number of cycles of the first communication signal equal to said predetermined number.

44. The method of Claim 43, wherein said first-mentioned using step includes using a delayed version of said first pulse to sample said first phase of said second cycle.

45. The method of Claim 43, wherein said first-mentioned using step includes using a third pulse of the sampling pulse signal to sample said first phase of a third cycle of the first communication signal, and wherein said third cycle follows said second cycle.

46. The method of Claim 45, wherein said third cycle follows said first cycle by a number of cycles of the first communication signal that is a multiple of said predetermined number.

47. The method of Claim 46, wherein said first-mentioned using step includes using a delayed version of said first pulse to sample said first phase of said second cycle.

48. The method of Claim 45, wherein said first-mentioned using step includes using a delayed version of said first pulse to sample said first phase of said second cycle.

49. The method of Claim 12, wherein said step of using pulses includes using a first pulse of the sampling pulse signal and a plurality of delayed versions of said first pulse to sample selected phases of the first communication signal.

50. The method of Claim 15, wherein said step of using pulses includes using a first pulse of the sampling pulse signal and a plurality of delayed versions of said first pulse to sample selected phases of the first communication signal.

51. The method of Claim 37, wherein said sampling step includes normally activating a plurality of sampling switches in a first temporal order to sample said plurality of phases, and providing said filter function by activating said plurality of switches in a second temporal order that differs from said first temporal order.